FUTURE COMBAT SYSTEMS

FCS

One Team-The Army/Defense/Industry

C4ISR and Networked Fires

Precision Strike Association Annual Symposium
April 21, 2004

MAJ (P) Dave Bassett

Program Manager's Intent: Field FCS-equipped Units of Action with Threshold Future Force Capability by the End of the Decade

Outline

FUTURE COMBAT SYSTEMS
FCS
One Team-The Army/Defense/Industry

- **Program Introduction**
- **C4ISR capabilities**
- **Networked Fires**

FCS Unit of Action Elements

One Team Partner Responsibilities

FUTURE COMBAT SYSTEMS
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Manned Ground Vehicles

General Dynamics / United Defense

102 Infantry Carrier

49 Command & Control

60 Mounted Combat Sys

30 Recon & Surveil.

18 NLOS Cannon

24 NLOS mortar

10 M[illegible]. & Recovery

29 Medical

Network / Software / C4ISR

Battle Command & Mission Execution – Raytheon

SOSCOE / Warfighter Machine Interface – Boeing

Level 1 Fusion – Lockheed Martin

Sensor Data Mgmt / Planning & Prep – GDDS

Situation Understanding – Austin Info Systems

Network Management – Northrop Grumman

Integrated Computer System – General Dynamics

Unattended Ground Sensors – Textron

Ground Sensor Integration – Raytheon

Air Sensor Integration – Northrop Grumman

Ground Comm & Air Comm – BAE Systems

Unmanned Air Vehicles

Class III - 12

Class II - 36

Class I - 54

Class IV - 2

Northrop Grumman

Logistics & Training

LDSS – Northrop Grumman

PSMRS – Honeywell

Training Support

- Northrop Grumman
- Dynamics Research Corp
- Computer Science Corp

Unmanned Ground Vehicles

45 Armed Robotic Vehicle

United Defense

81 Small UGV

iRobot

78 Mule

Lockheed Martin

Auto. Navigation - GDRS

Unattended Munitions

NLOS LS (LAM, PAM) 60

Intelligent Munition System

Non-FCS Elements

Trucks 376

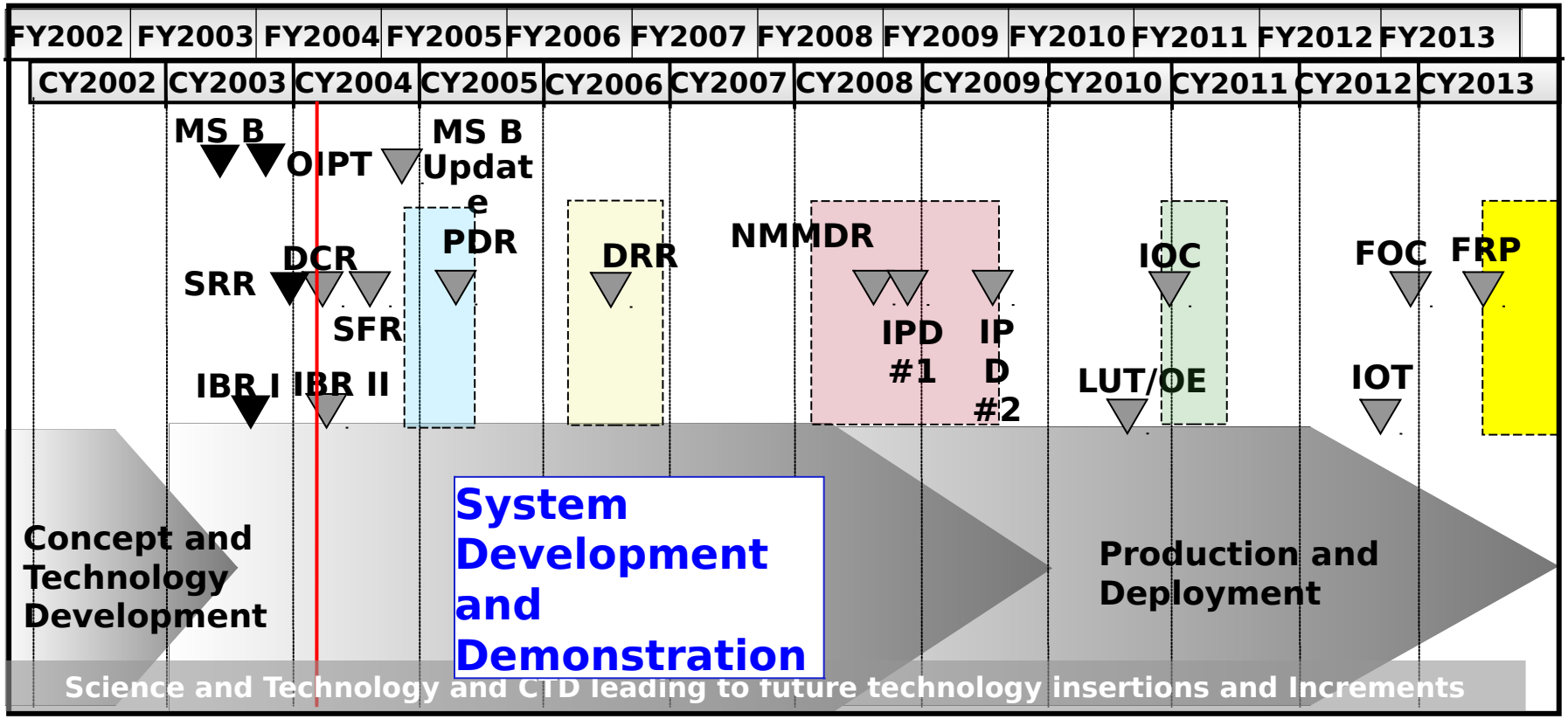
81 mm Mortar 12

RAH-66 Comanche 12

AAFARS 2 , HTARS 2

FCS Program Master Schedule

FUTURE COMBAT SYSTEMS
FCS
One Team-The Army/Defense/Industry



MS B - Milestone B
OIPT - Overarching Integrating Process Team
IBR - Integrated Baseline Review
PDR - Preliminary Design Review
DRR – Design Readiness Review
IOC – Initial Operating Capability
LUT/OE – Limited User Test / Operational Evaluation
Milestone Decision Review

IOT – Initial Operational Test
FOC – Full Operating Capability
SRR – System Readiness Review
DCR – Design Concept Review
IPD – Initial Production Decision
SFR – System of Systems Functional Review
NMMDR – Network Maturity

Network Maturity Milestone Decision Review (NMMDR) – 7/11/2008
Initial Production Decision #1 (IPD #1) – 11/14/2008
Initial Production Decision #2 (IPD #2) – 8/14/2009

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- **C4ISR capabilities**
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C4ISR Overview

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Information Domain

Joint Common Database

Common Operating Picture

Interoperable export

Information Layer "UA Infosphere"

Logical Database

CROP

Open Software Architecture

RT Synchronization

FIOP

Interoperability Domain

JTRS

EPLRS Link 4A
SINCGARS Link 11
VHF Link 16

Reachback

HHQ

XX

UE/HQ

Battle Command

HQ

Information Management

Common Services

Planning
Fires & Effects
Information Ops
RSTA
C4ISR Mgmt
Sustainment
Situation Awareness
Execution
Intelligence
Airspace C2
Training & Rehearsal
Nontactical Support

Warfighter Interface

WIN-T

Hierarchical Ad-Hoc Network

MOSAIC

MOSAIC

stubnet

UGS

Data
Images
Voice
Video

Vetronics

EO/IR

EO/IR
SAR/MTI

CROP

CROP

CROP

CROP

Platform Systems Domain

Common Vehicle
bsystems

Network-Centric Warfighting Domain

O&O V1.0

System of Systems Common Operating Environment (SOSCOE)

FUTURE COMBAT SYSTEMS
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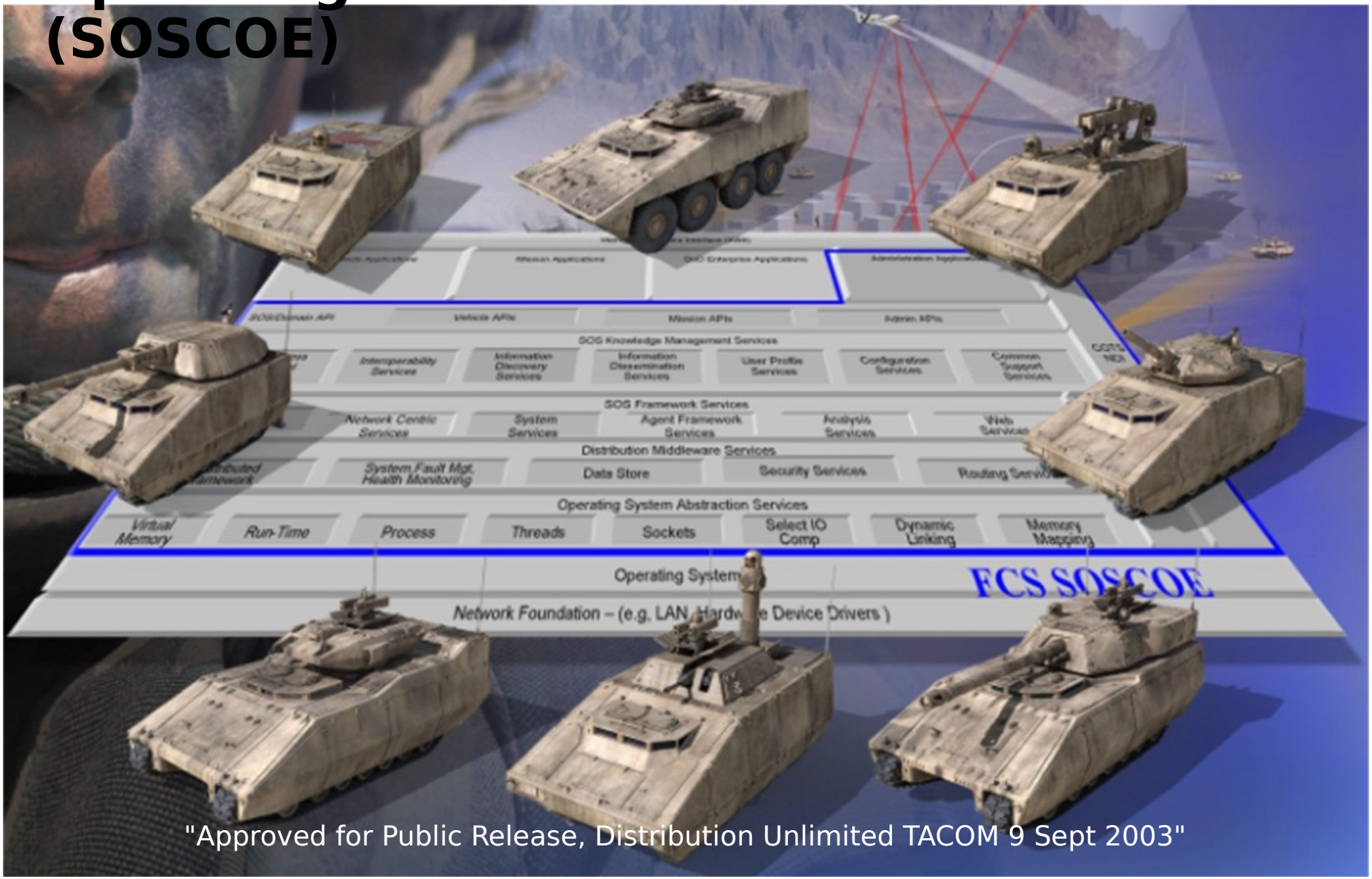
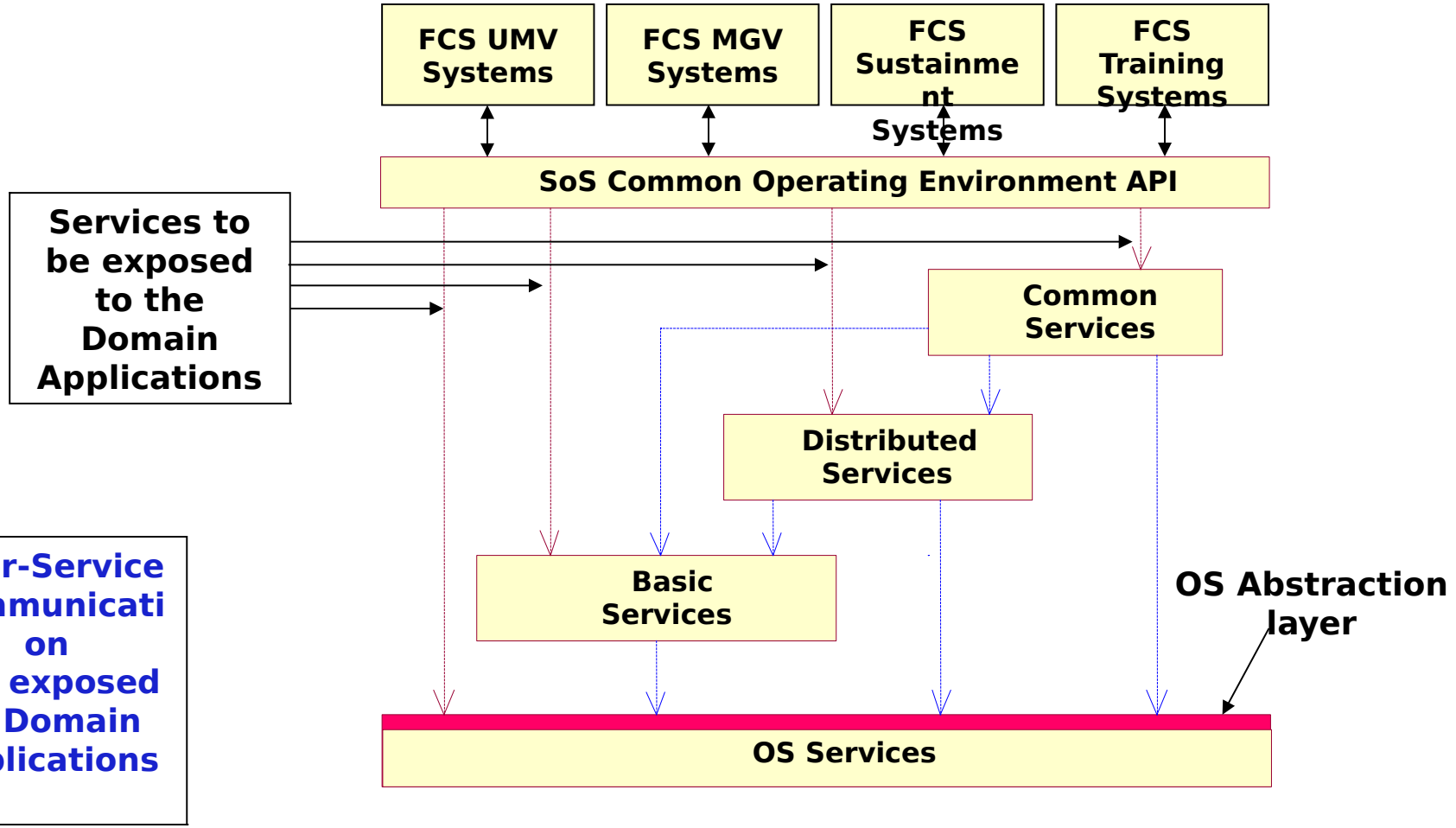


"Approved for Public Release, Distribution Unlimited TACOM 9 Sept 2003"

Domain Application Interfaces with SOSCOE "Family" of APIs



Outline

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- Program Introduction
- C4ISR capabilities
- **Networked Fires**

See First/Persistent ISR

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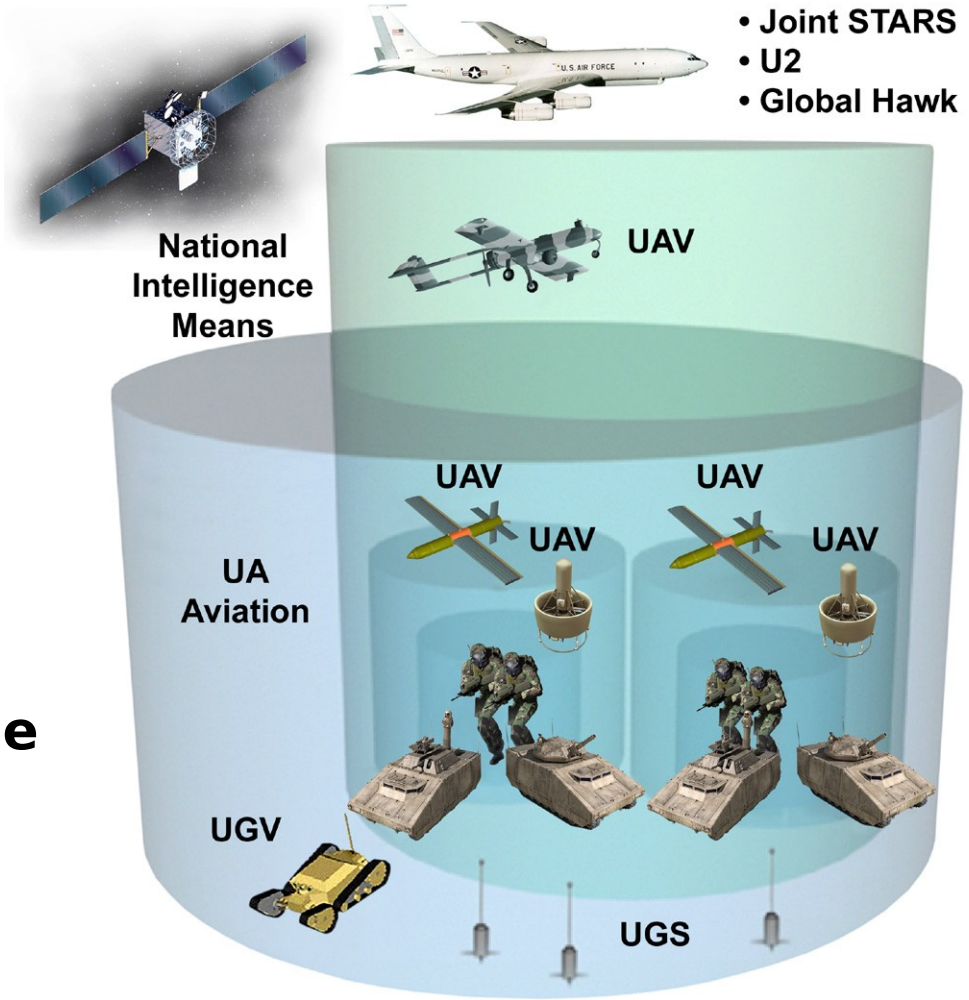
Distributed/Networked Sensors

- **Provides unequaled Situational Awareness down to the Soldier System**
- **Enhances survivability through knowing and avoiding enemy fires**
- **Enables precision engagement beyond the effective range of the opponent**
- **Maintain contact and engagement in detail throughout the mission**



Understand First/Act First/Finish Decisively

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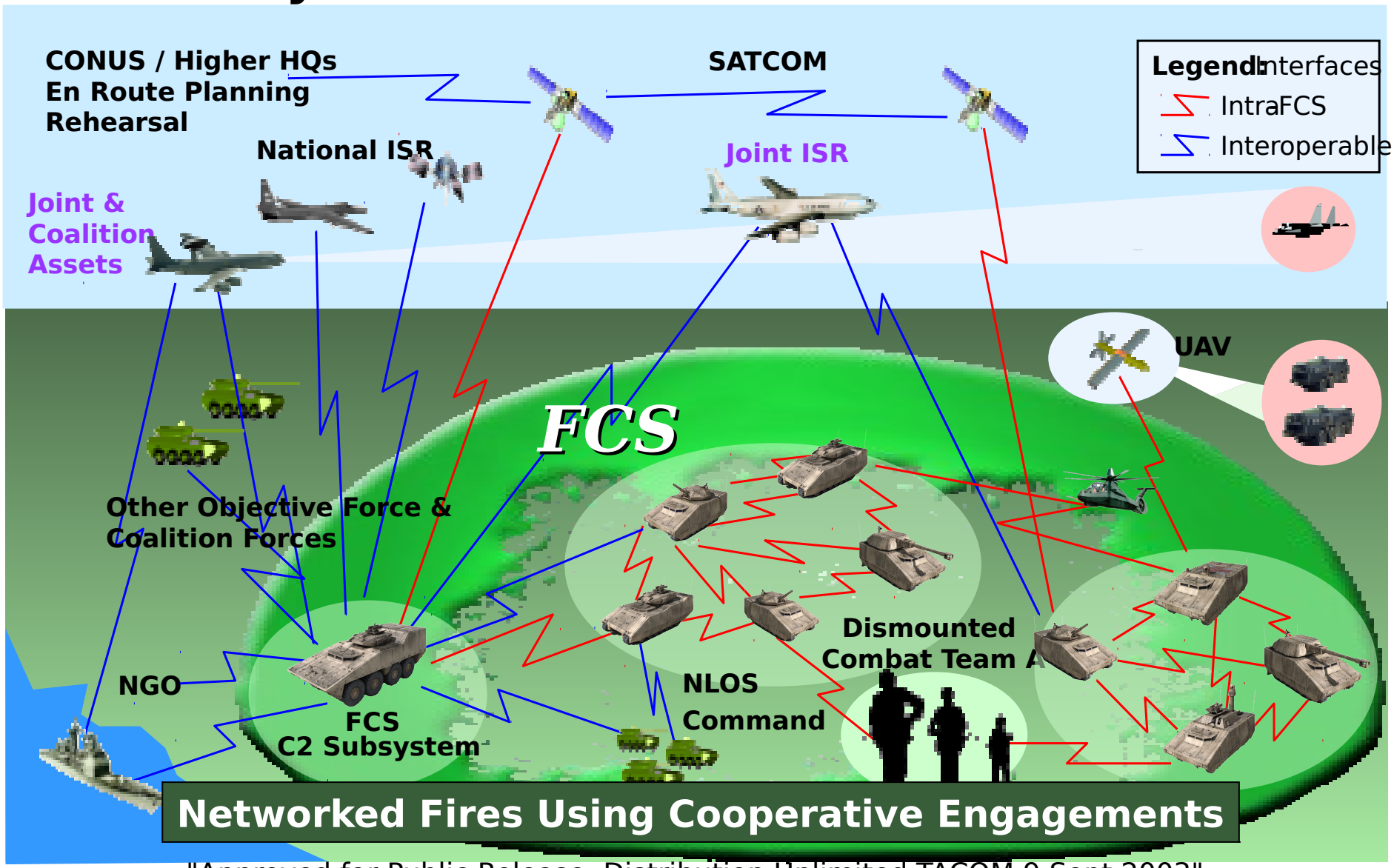

Networked Fires Process

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Networked Fires are comprised of BLOS and NLOS and some LOS (Cooperative Engagement) fires focused to achieve an effect. While the principal applications of Networked Fires will come from NLOS units employing FCS Cannon and NLOS LS systems, BLOS and LOS weapons may be tasked to support Networked Fires.

Conduct Networked Fires- Process consists of a sequence of operational tasks and their associated information exchanges that must be performed to achieve the commander's intent through the synergistic application of all available lethal and non-lethal effects.

This integrated process consists of the following steps:

Step 1: Define/update Attack Guidance.

Step 2: Perform ISR Integration

Step 3: Detect and locate surface/air targets.

Step 4: Provide Intelligence Support to Target Development

Step 5: Assign effectors to target.

Step 6: Track Targets for Engagement.

Step 7: Establish sensor-to-shooter linkages.

Step 8: Deconflict mission with air/ground and UE /JIM forces.

Step 9: Engage targets

Step 10: Conduct Battle Damage Assessment

Step 11: Provide re-attack

NLOS-LS Elements

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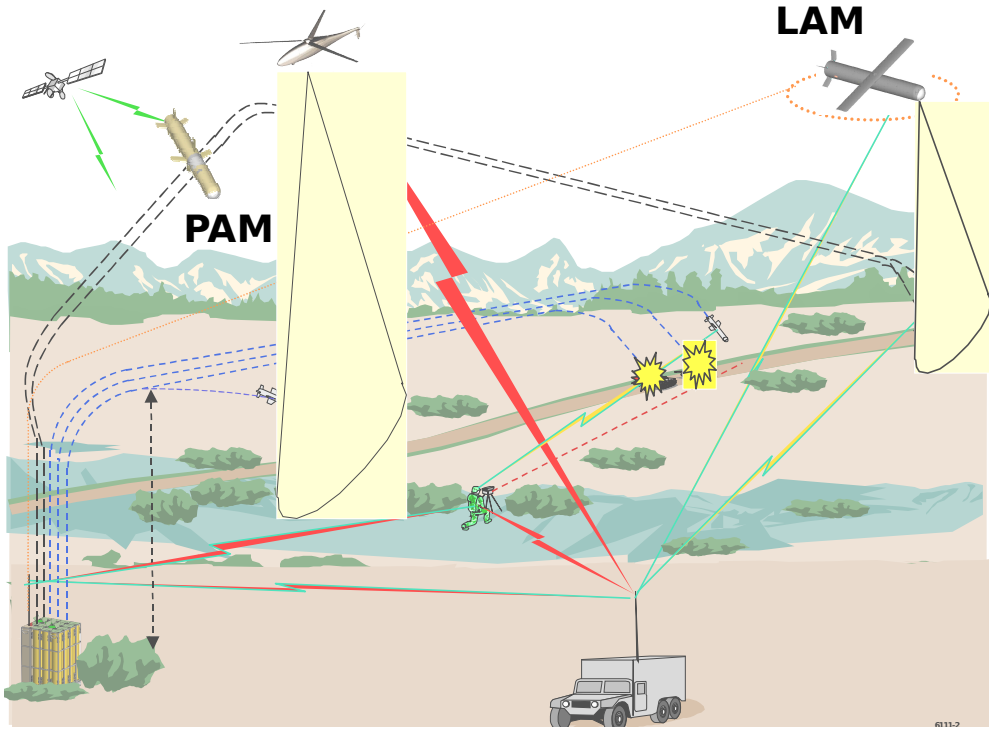
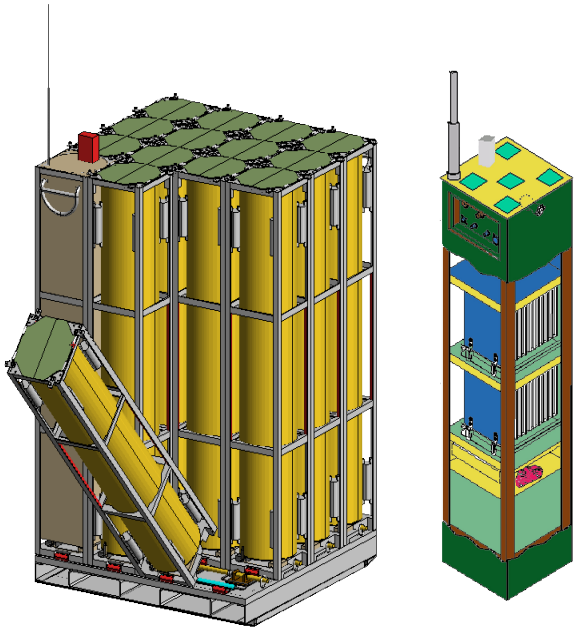
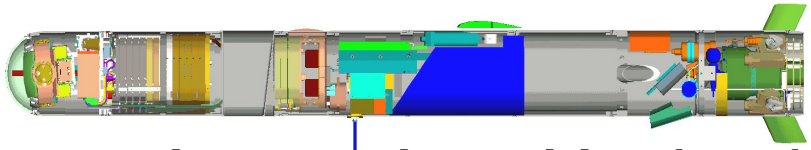
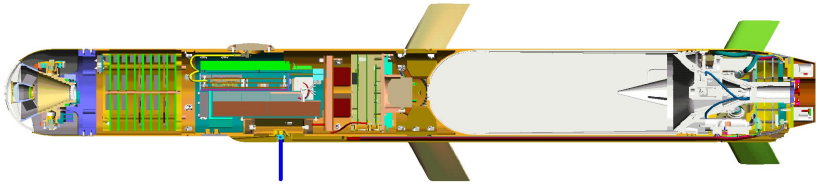




Container/Launch Unit



Loiter Attack Munition (LAM)



Precision Attack Munition (PAM)

NLOS-LS TO BE ONE OF THE "UNATTENDED MUNITIONS" WITHIN THE FCS FAMILY OF SYSTEMS

NLOS-LS System Description

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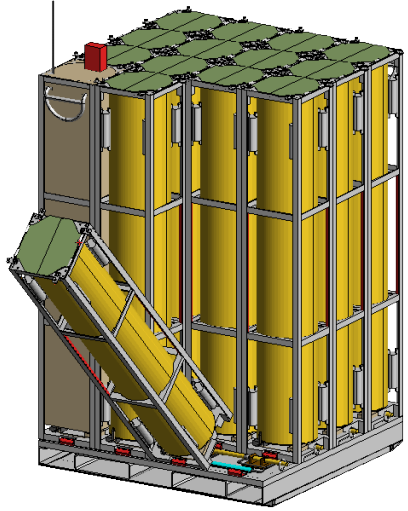
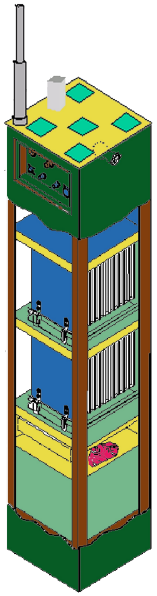
System Capabilities:

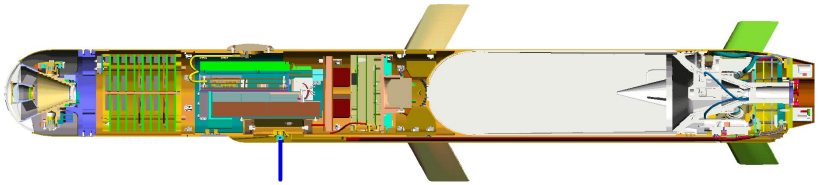
- Networked, extended range targeting and precision attack of a variety of targets including fleeting high value and both moving and stationary armor
- Platform independent vertically launched missile system with self contained fire control and communications
- Automatic/Aided Target Recognition
- Two-way networked data link

Container/Launch Unit

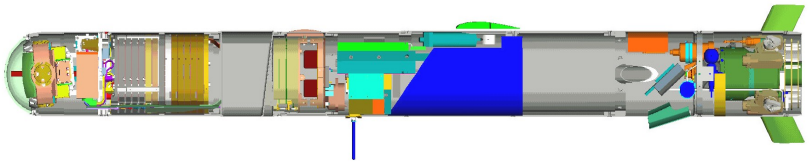


Missile Computer & Commo System





Precision Attack Munition (PAM)



Loiter Attack Munition (LAM)

Characteristics/Description:

- FCS UA Core System
- Transitions Army/DARPA NetFires Demo Program into Development and Production

Networked Fires NLOS/BLOS

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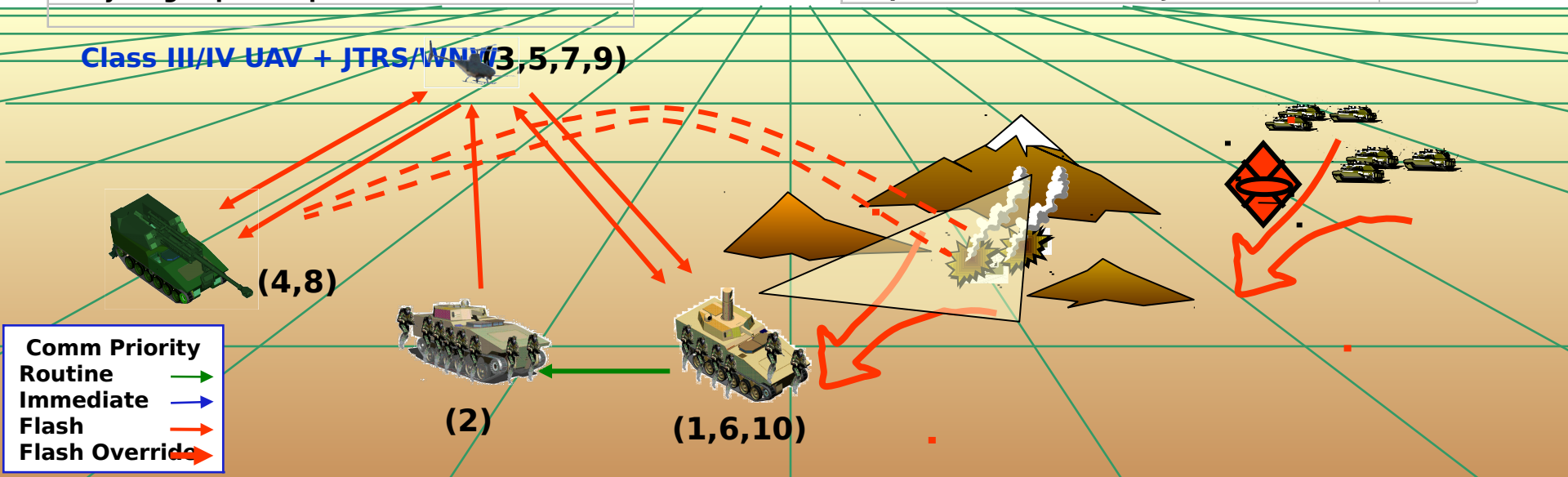
(1) R&SV detects potential target
- Acquires target data & geolocates (Mast Sensors)
- Performs Combat ID
- Prepares Spot report, Updates NCIE
- Reports Target via J TRS WNW
(2) C2V
- BCS (TIN/SoSCOE ICS)Wpn Tgt pairing/de-confliction
- Calls for fire via J TRS/WNW
(3) CLIII/IV Comm Relay
- Relays Call for fire via J TRS/WNW
(4) NLOS Cannon/Mortar/MCS
- Receives/accepts fire mission
- Calls for Target update via J TRS/WNW
(5) CLIII/IV Comm Relay
-Relays target update request

(6) R&SV	
- Updates Target data	
(7) CLIII/IV Comm Relay	
-Relay target update	
(8) NLOS Cannon/Mortar/MCS	
- Updates gun data & fire	
- Publish fires data, R&SV designate timeline	
- Munition TOF (MRM)	
(9) CLIII/IV Comm Relay	
- Relays fire mission designation requirements	
(10) R&SV	
- Designates per fire mission	
- Observes strike, prepares BDA report	
- Reports mission (SADB) via J TRS/WNW	



Battle Command Software Services

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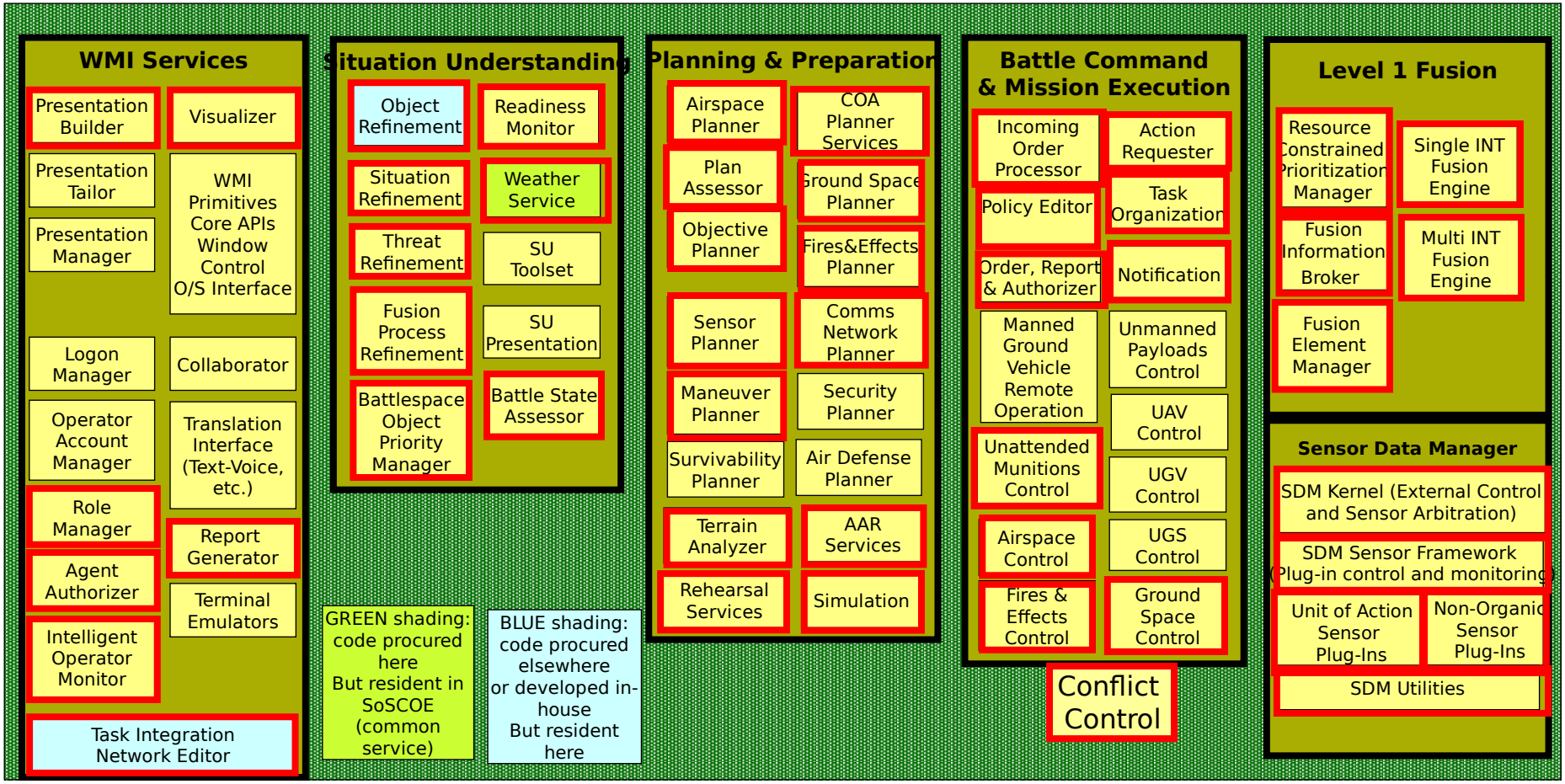

Ver3.01
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Networked Fires for "Deliver Effects"

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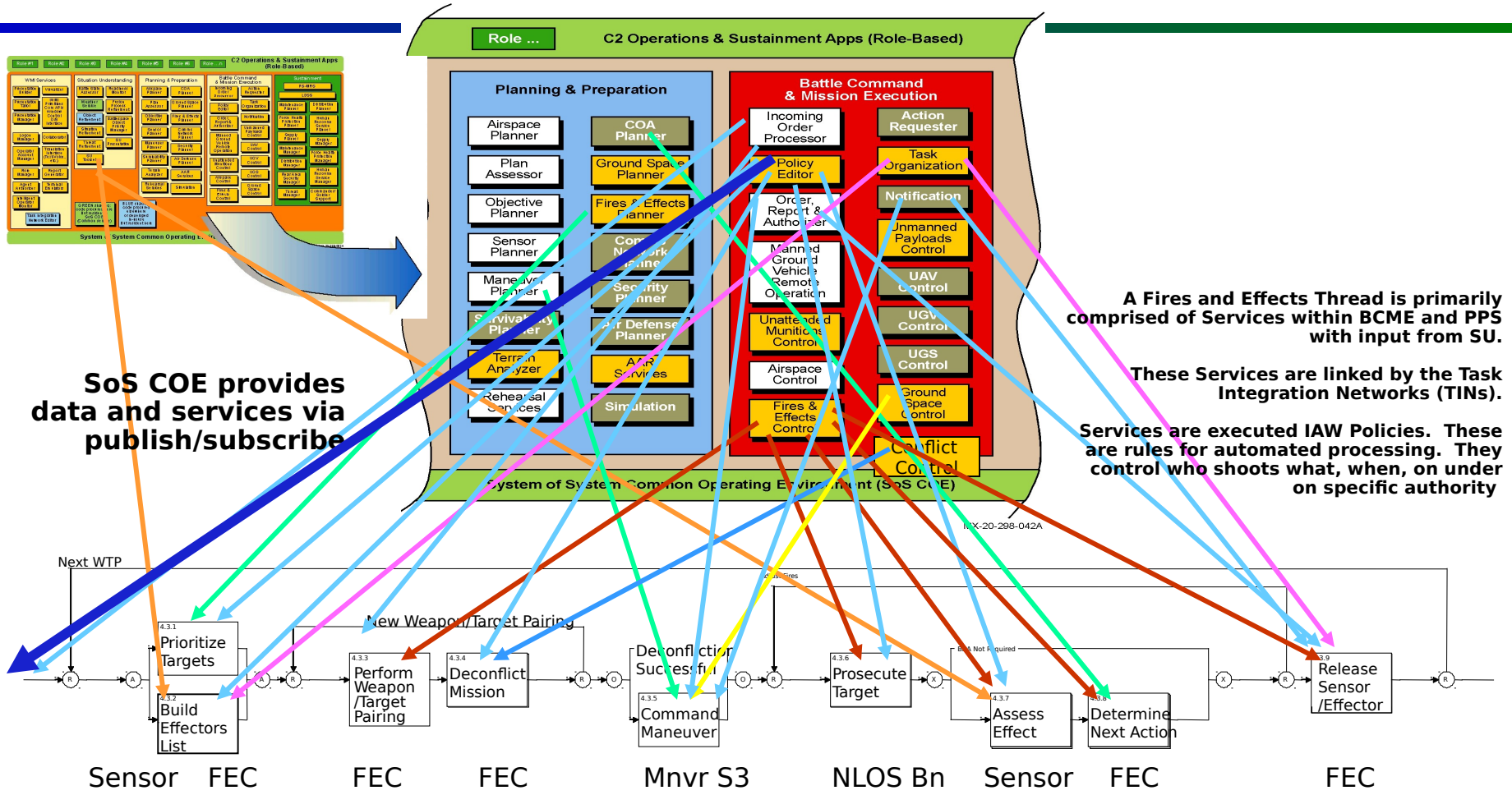

The execution of the logic of the Services comprising the TIN can occur throughout the network based on the behavior described by the rules set by the POLICY EDITOR.

Gain is less message traffic across the network, faster response, and greater mission throughput vice current the model of serial mission

Summary

FUTURE COMBAT SYSTEMS
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- FCS subset of UA subset of UE subset of Joint Forces subset of Multinational Forces (FCS -> UA -> UE -> Joint -> Multinational)
- FCS Family of Systems defined in ORD
- Multidimensional System of Systems Integration
  - KPP axis: 7 KPPs
  - Systems axis: MGV, UGV, UAV, NLOS-LS, IMS
  - Components
- C4ISR = C2 + CC + ISR + SOSCOE
- SOSCOE
  - Software layer in all FCS Family of Systems
  - Eases integration of distributed capabilities
- C2: 4 areas: WMI, SU, BC PP
- SOSCOE and C2 software packages enable Networked Lethality
- Networked Fires key to the employment of FCS

Backups

FCS ISR Philosophy

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- **Be flexible and adaptable**
  - Use modular payloads
  - Upgrade easily
  - Locate human interface anywhere
- **Decentralize**
  - Collection of small sensors
  - Fuse data locally before hierarchically
  - Analysts can be centralized or distributed
- **Tailor sensors**
  - Local area and MOUT sensors for platoons
  - Wide-area coverage for Brigade
  - Deploy SIGINT/ESM widely to detect hidden targets
- **Tailor presentation**
  - Reconfigure display to consumer
- **Focus organic ISR coverage**
  - Exploit UE+ assets for wide-area coverage
  - Deploy organic ISR forward
- **Provide timely sensing**
  - Update close, critical regions most often
  - Use local resources for fast response
- **Provide quality sensing**
  - Correlate to reduce false tracks due to false, redundant detects
  - Match sensor (and system of sensor) accuracy to weapons
- **Blocked approach**
  - Block 1 is strongly capability based but guided by Block 2 directions
  - Block 2 will be more top-down

Integrator Roles

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- **System Engineering**
  - Translate top-down requirements to sensors
  - Refine internal interfaces
  - Develop platform-to-sensor interfaces
- **Commonality & Growth**
  - Ensure commonality of parts
  - Define standard, public interfaces for modularity
  - Develop design principles to reduce upgrade cost/schedule
- **Test**
  - Develop V&V plan
  - Integrate SW and HW
  - Support LSI C4ISR SIL

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The Infosphere Is Our Domain for Information Management

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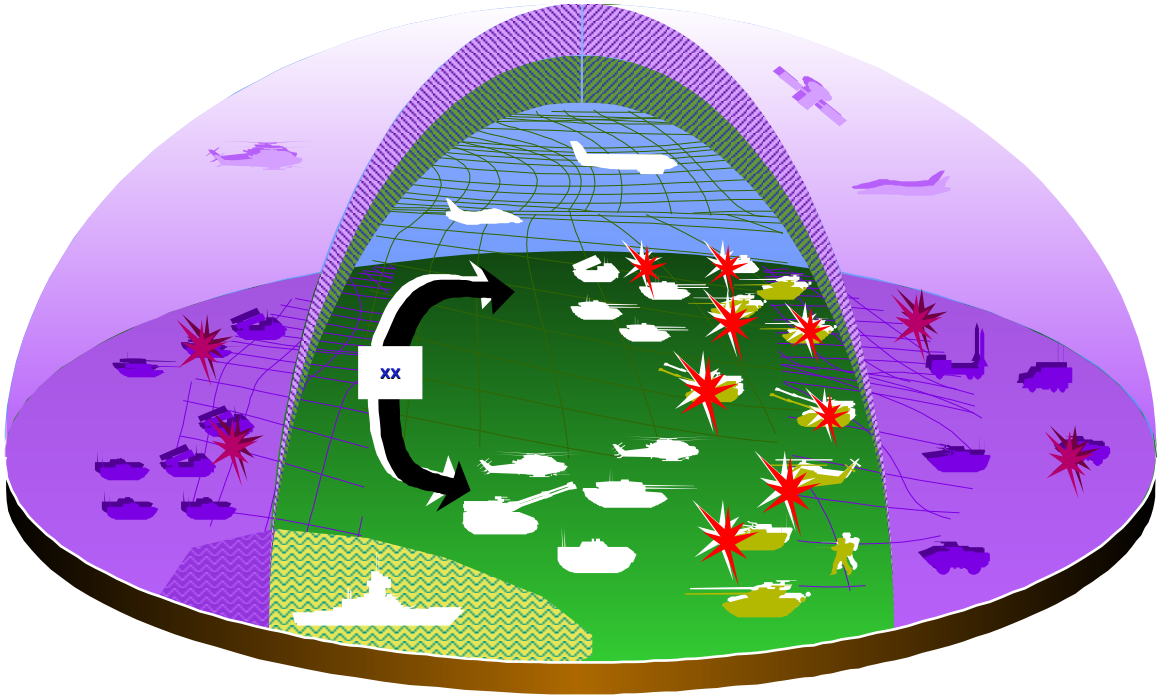
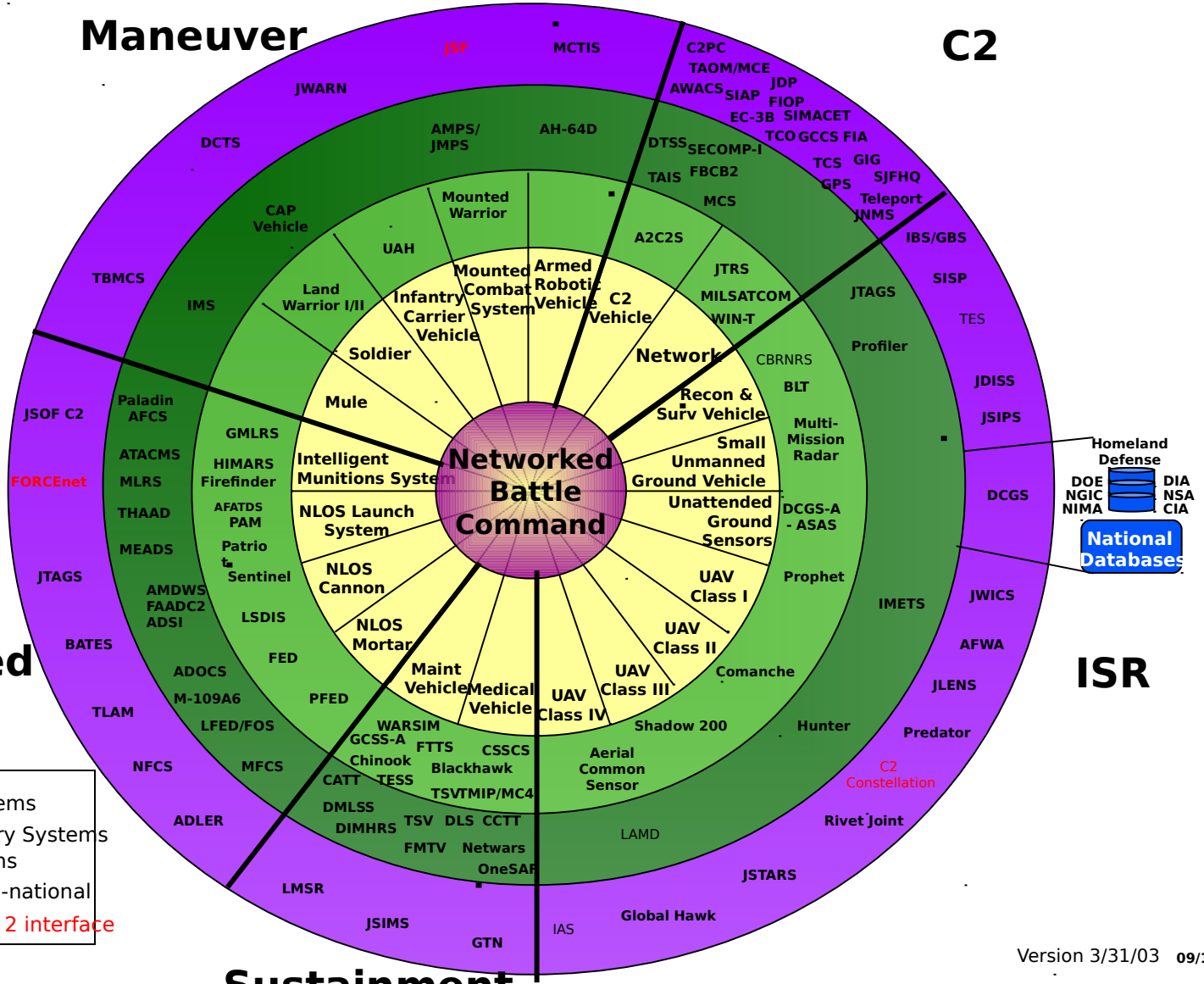


- Worldwide information source access
- Shared and managed information
- Controlled access to sensitive information
- Tools and services for info
  ulation
  d information
  n user

Affordable Data Structures That Use Available Worldwide Databases and Information Fusion In Near Real Time

FCS Interfaces and Interoperability



Role of the LSI

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- **Why a Lead Systems Integrator (LSI)…**
  - **The Army's first large scale "system of systems" development, integration across many disciplines and platforms, requires a robust / dedicated organization experienced in large scale systems integration**

- **What the LSI does…**
  - **Trusted Industry member of the FCS Team (ARMY /Defense/ Best of Industry) that has total systems integration responsibility ("top down" development)**
  - **Provides the Team a "general contractor" *focused on integration* for resource allocation, subcontract implementation and coordination, and programmatic responsibilities**
  - **Provides the vital link to the "Best of Industry" including domestic / foreign contractors, Government programs / Labs, and educational institutions**

- **W**
  - **requirements**

Synchronize and influence the piece parts which will become the network

Dependent on players within and outside the Army

What Is “One Team”

FUTURE COMBAT SYSTEMS
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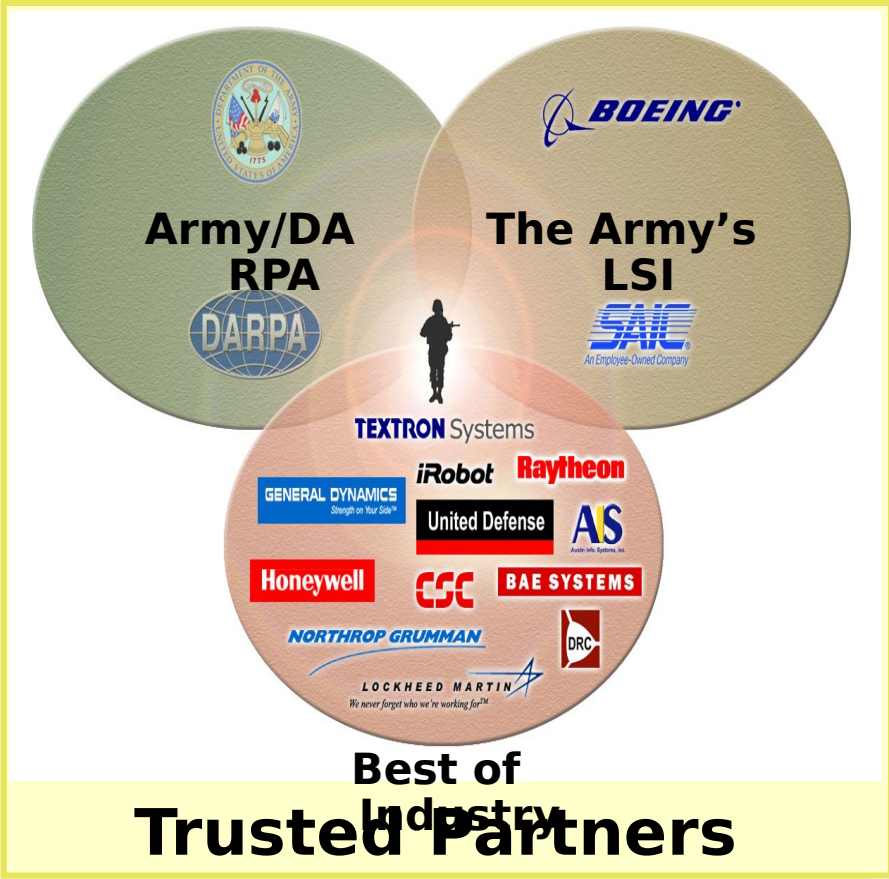
One Team-The Army/Defense/Industry

- Army, LSI and Industrial Partners Organizationally Integrated
- All Executing to the Same Plan
- All Using the Same Processes and Best Practices
- All Sharing the Same Timely Data for Control and Corrective Action
- All Incentivized to Share the Same Destiny



Key Enabler: Electronic Integration for Geographically Dispersed Team with Site-Specific Systems

What does "Network Centric" Buy Us?

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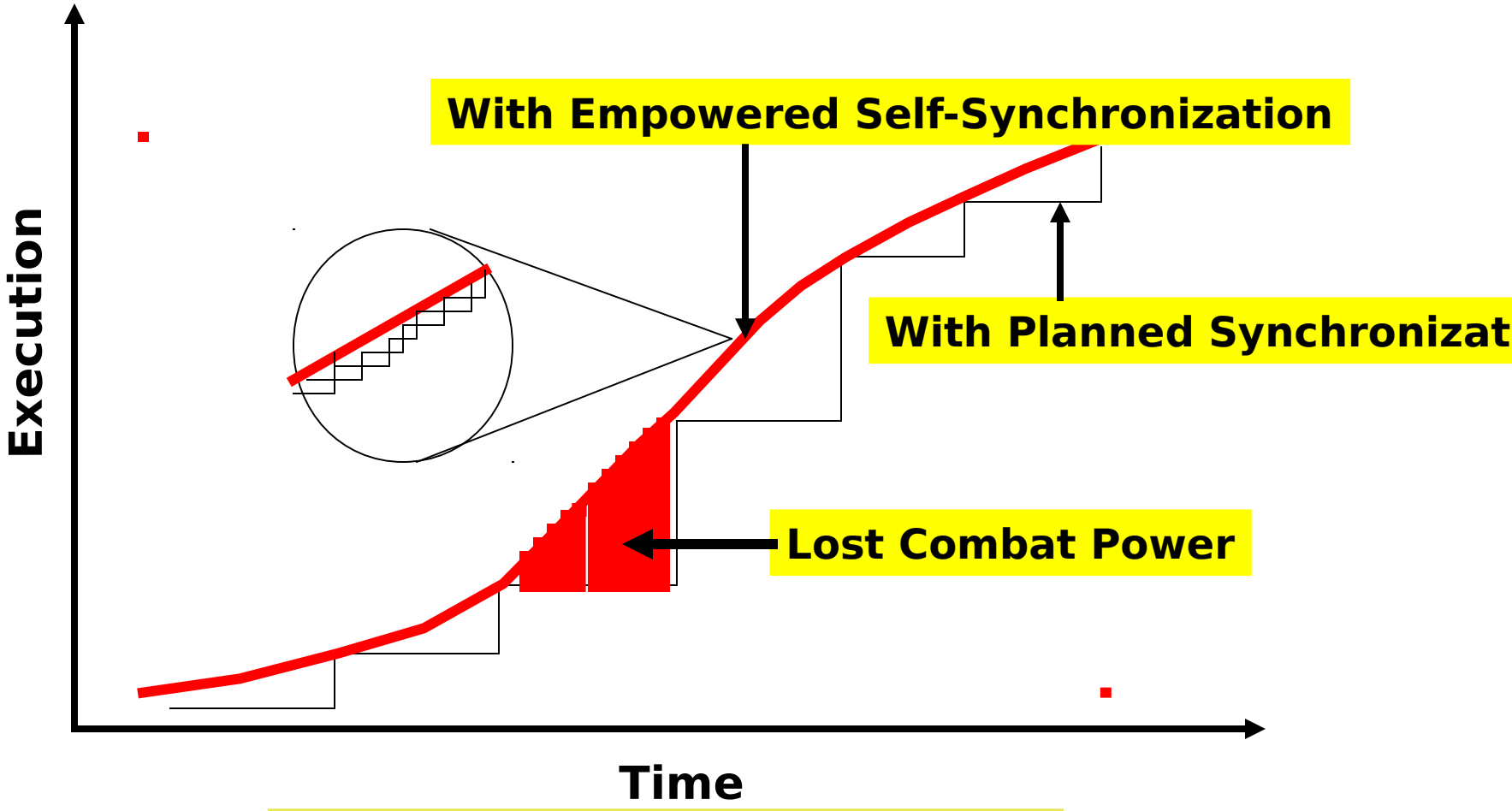

New Sciences and Warfare
VADM A.K. Cebrowski 9/21/98

Building the "Best of Industry" Team

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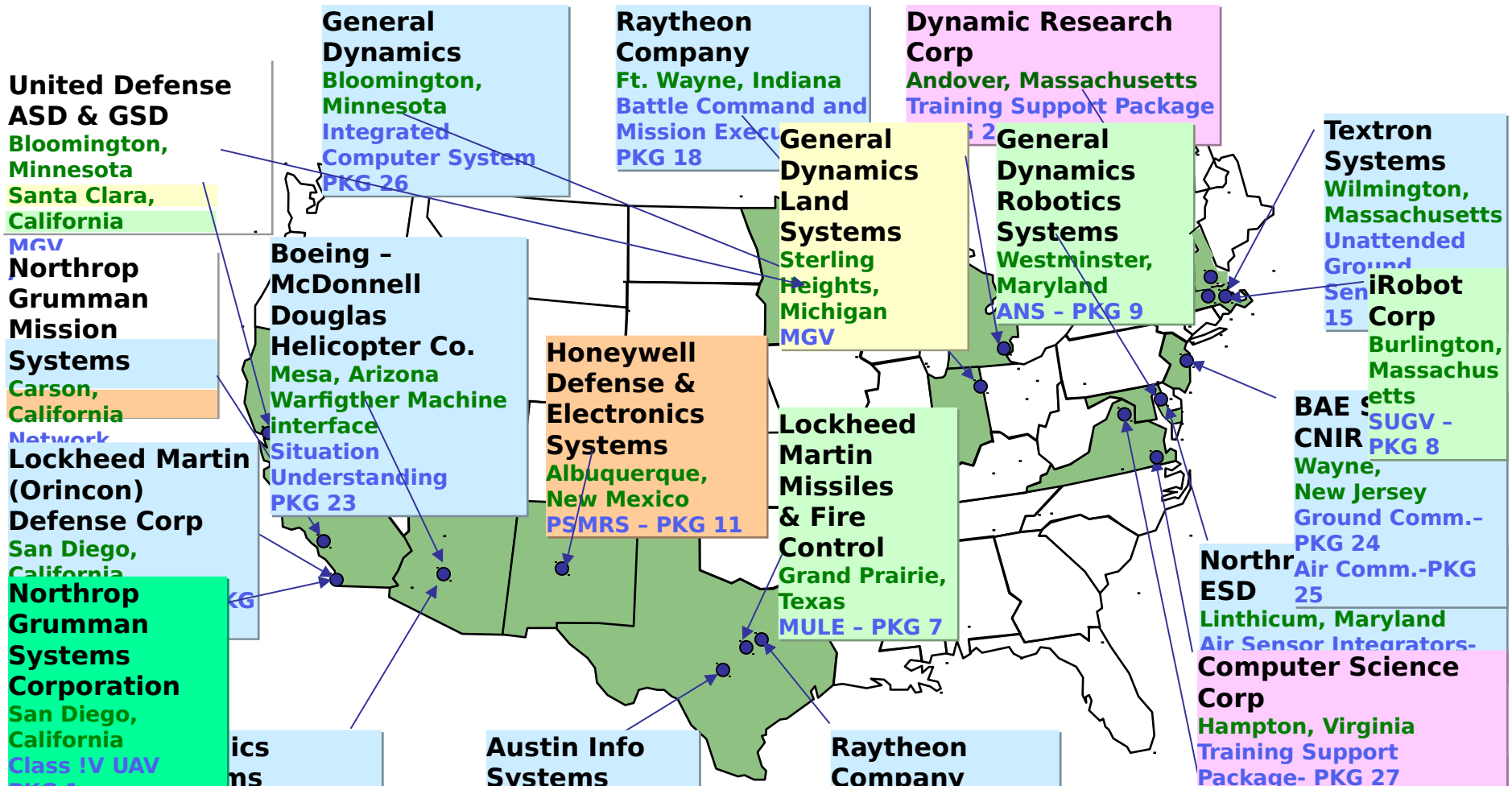
C4ISR | UAV | UGV | Logistics | Training Support | MGV



FCS Network Centric Architecture

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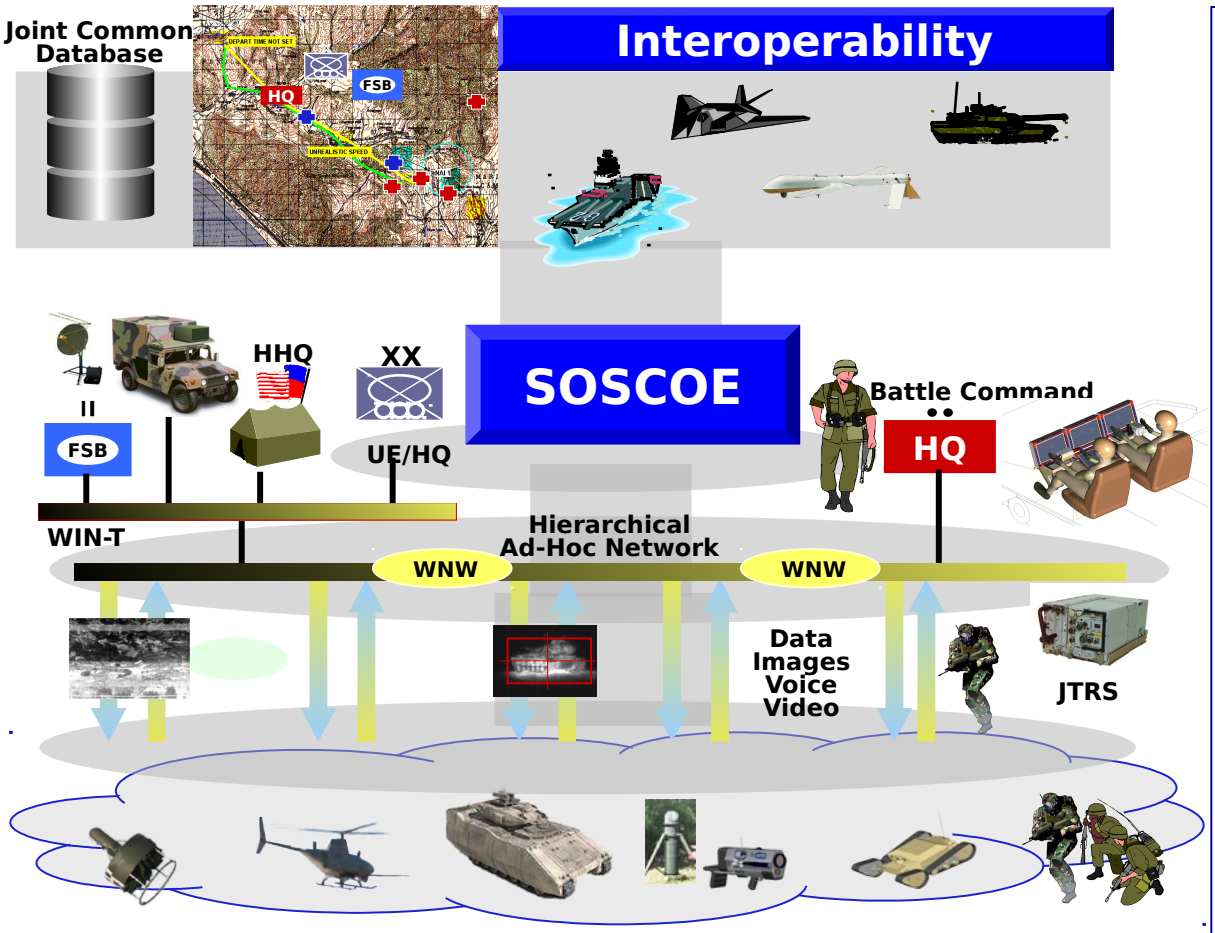

Key Performance Parameters

1. Joint Interoperability
2. Networked Battle Command
3. Networked Lethality
4. Transportability
5. Sustainability/Reliability
6. Training
7. Survivability

FCS Advantage:

- Conflict duration: 50-60%
- Survivability: 60-80%
- Logistics footprint: 30-70%

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Defining Program Relationships: Complementary Programs

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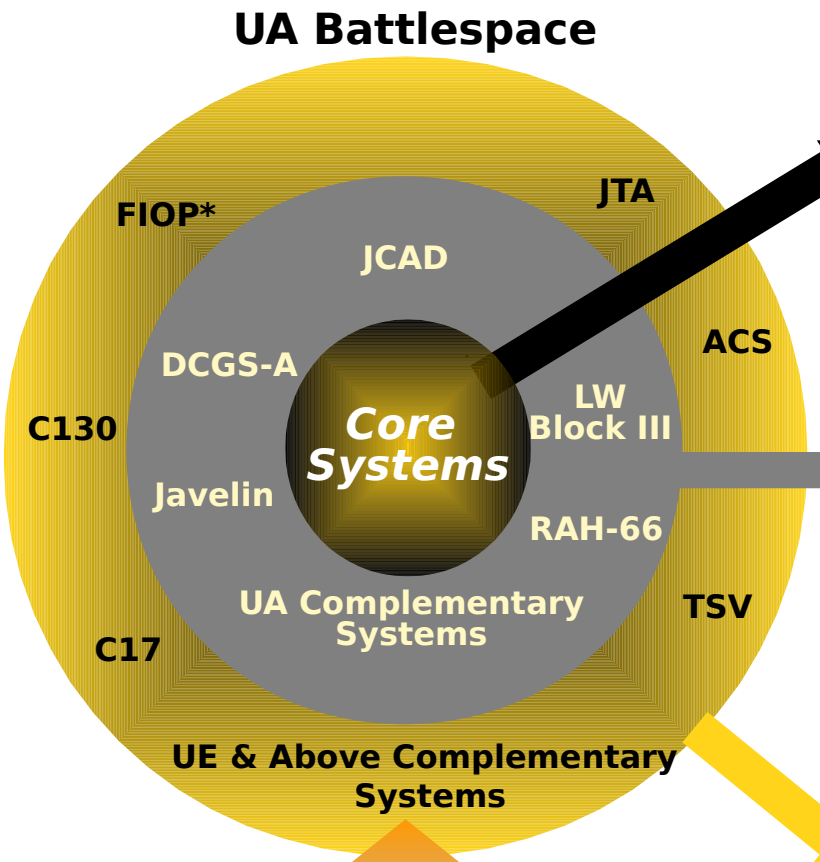

FCS Core:
Defined as the 19 Systems specifically called out in the FCS ORD, to include current programs that will be integrated directly into the 19 Systems. FCS is responsible for the integration and procurement of these systems into FCS

UA Complementary:
Those existing systems essential to get the family of systems to work together but are not part of the FCS Core Systems, or to facilitate operation of an individual core system. They will also have applicability outside the FCS Core Systems. Those systems needed to operate or support a system of systems within the UA but not FCS core systems. Unit set fielding implications.

UE & Above Complementary: Those systems needed to operate or support a system of systems outside the UA.

Interoperability

Future Force Capability

Future Increments Technology Base

** Family of Interoperable Operational Pictures*

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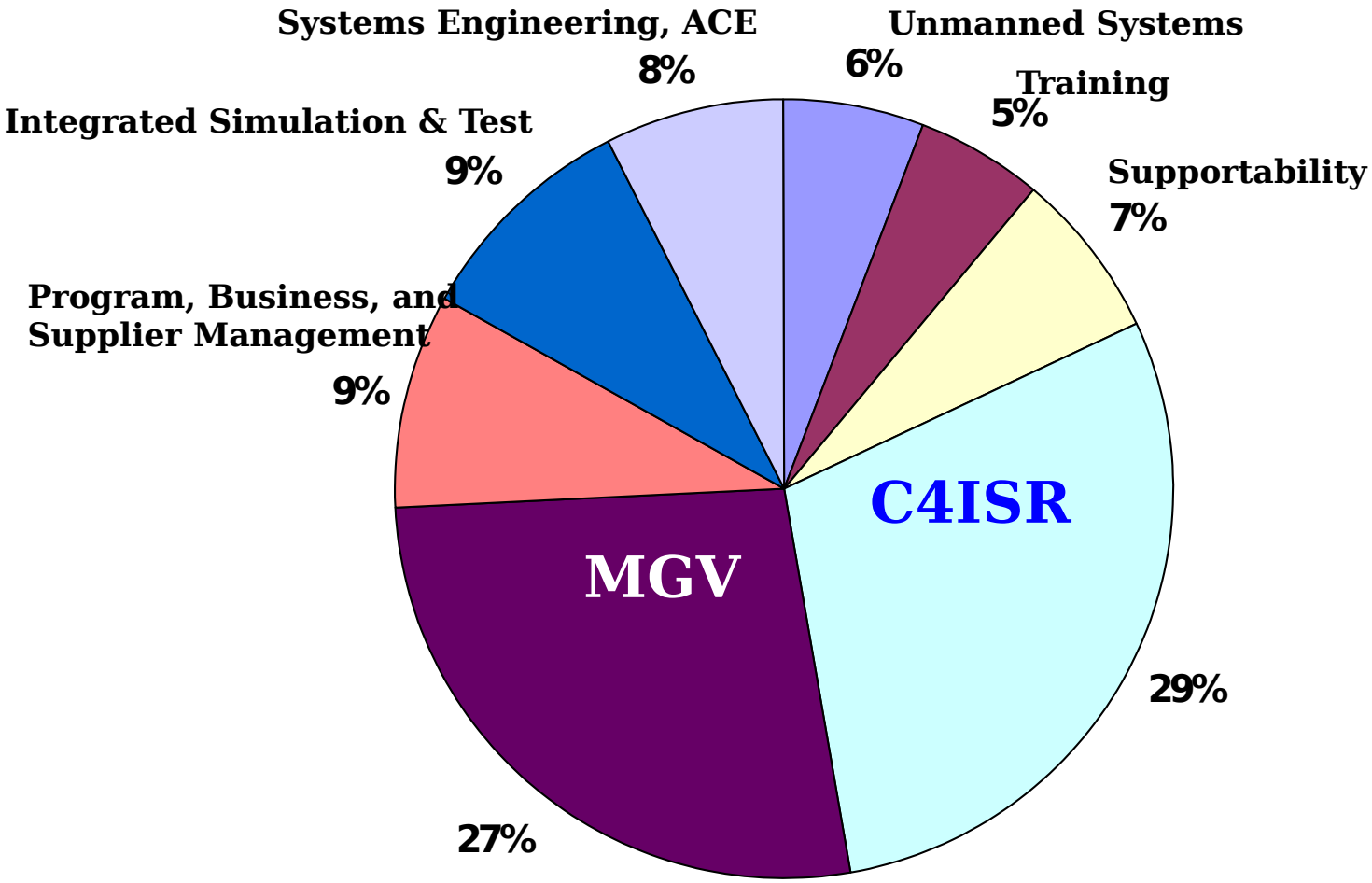
FCS IPTs by % Work Share



* Software distributed throughout IPTs

FCS Increment I

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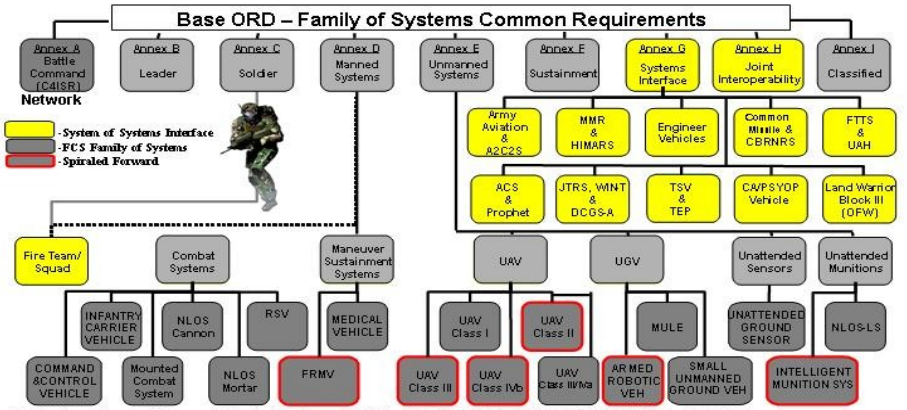
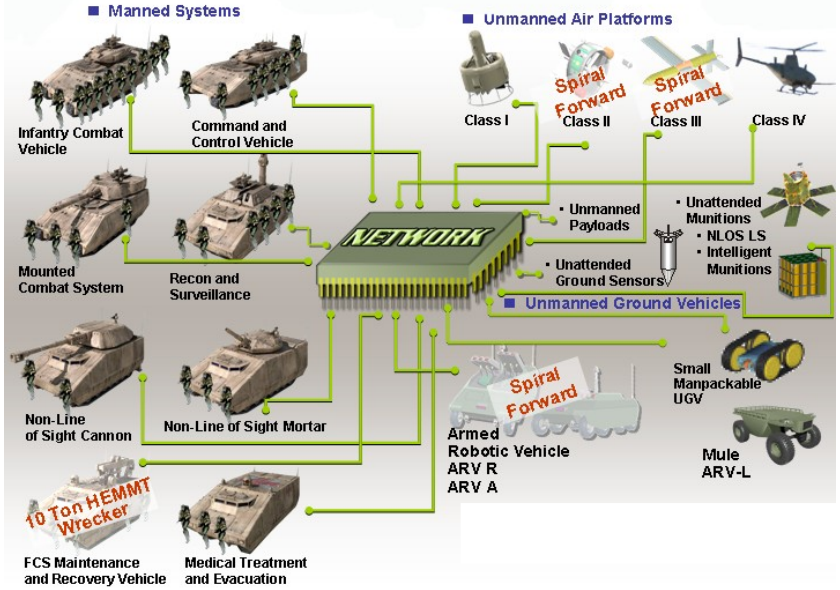
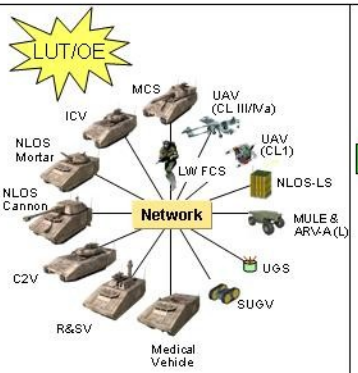

Base ORD – Family of Systems Common Requirements
Annex A Battle Command (C4ISR) Network
Annex B Leader
Annex C Soldier
Annex D Manned Systems
Annex E Unmanned Systems
Annex F Sustainment
Annex G Systems Interface
Annex H Joint Interoperability
Annex I Classified
-System of Systems Interface
-FCS Family of Systems
-Spiraled Forward
Army Aviation & A2C2S
MMR & HIMARS
Engineer Vehicles
Common Missile & CBRNRS
FTTS & UAH
ACS & Prophet
JTRS, WIN-T & DCGS-A
TSV & TEP
CA/PSYOP Vehicle
Land Warrior Block III (OFW)
Fire Team/ Squad
Combat Systems
Maneuver Sustainment Systems
UAV
UGV
Unattended Sensors
Unattended Munitions
INFANTRY CARRIER VEHICLE
NLOS Cannon
RSV
MEDICAL VEHICLE
UAV Class I
UAV Class II
MULE
UNATTENDED GROUND SENSOR
NLOS-LS
COMMAND &CONTROL VEHICLE
Mounted Combat System
NLOS Mortar
FRMV
UAV Class III
UAV Class IVb
UAV Class III/IVa
ARMED ROBOTIC VEH
SMALL UNMANNED GROUND VEH
INTELLIGENT MUNITION SYS
A2C2S – Army Airspace Command & Control System
ACS – Aerial Common Sensor
ARV – Armed Robotic Vehicle
C2V – Command and Control Vehicle
CA/PSYOP – Civil Affairs and PSYOP Vehicle
CBRNRS – CBRN Reconnaissance System
DCGS-A – Distributed Common Ground System – Army
FRMV – FCS Recovery and Maintenance Vehicle
FTTS – Family of Tactical Truck Systems
HIMARS – High Mobility Artillery Rocket System
ICV – Infantry Carrier Vehicle
IMS – Intelligent Munitions System
JTRS – Joint Tactical Radio System
LOS – Line of Sight
MCS – Mounted Combat System
MMR – Multi-Mission Radar
MULE – Multi-function Utility/Log Equip. Veh.
MV – Medical Vehicle
NLOS – C – Non-Line of Sight - Cannon
NLOS – M – Mortar
NLOS – LS – Launch System
RSV – Reconnaissance and Surveillance Veh
SUGV – Small Unmanned Ground Vehicle
TEP – Tactical Electrical Power
TSV – Theater Support Vessel
UAH – Up Armored HMMWV
UAV – Unmanned Aerial Vehicle
UGS – Unattended Ground Sensors
UGV – Unmanned Ground Vehicles

FCS Increment I



2008 IOC - 2010

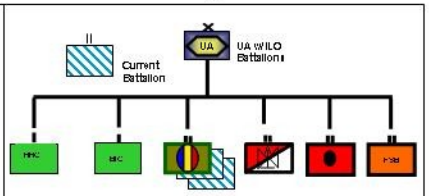
Network Prototypes Training Testing



- HEMTT Wrecker ILO for FCS Recovery & Maintenance Vehicle
- 10 GSTAMIDS with Mule Carrier

KPPs: Essential Joint Interoperability, Networked Battle Command, Networked Lethality, Transportability, Training, Survivability (Limited Achievement of KPPs)

2010 Organization

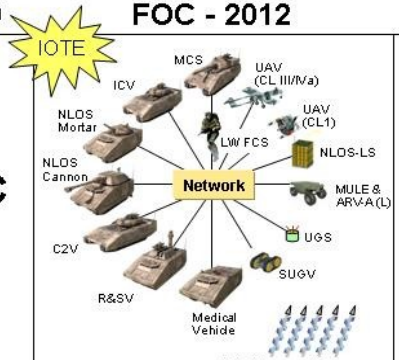


Manned Systems:		Unmanned Systems:	
•MCS	20	•UAV (CL III/IVa)	17
•ICV	26	•UAV (CL I)	15
•NLOS-Mortar	8	•NLOS-LS	8
•NLOS-Cannon	6	•MULE & ARV-A(L)	1285
•C2V	24	•UGS	50
•R&SV	10	•SUGV	18
•Medical Vehicle	9		

UA (w/2 Current Battalions)

2010 FOC - 2012

IOC

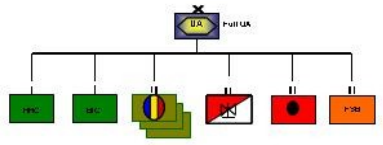


- HEMTT Wrecker ILO for FCS Recovery & Maintenance Vehicle
- 24 GSTAMIDS with Mule Carrier

Spiral Forward Systems:
- UAV (CL II)
- Armed Robotic Vehicle-Assault & Recon Variants
- Loitering Attack Munitions
- Intelligent Munitions System

KPPs: **Full-Threshold Joint Interoperability**, Networked Battle Command, Networked Lethality, Transportability, **Sustainability/Reliability**, Training, & Survivability

2012 Organization



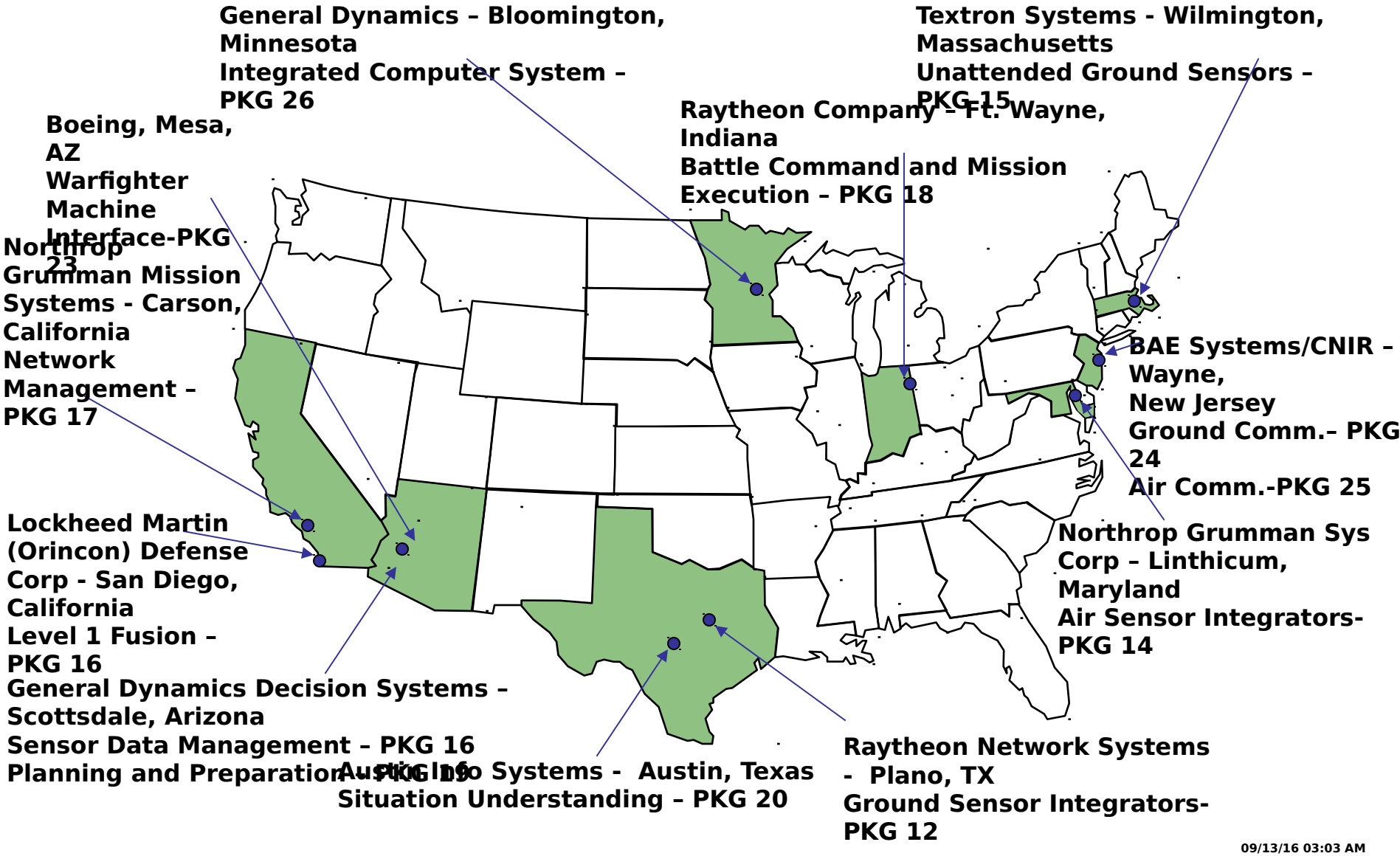
Manned Systems:		Unmanned Systems:	
•MCS	60	•UAV (CL III/IVa)	56
•ICV	84	•UAV (CL I)	54
•NLOS-Mortar	24	•NLOS-LS	24
•NLOS-Cannon	18	•MULE & ARV-A(L)	54827
•C2V	49	•UGS	157
•R&SV	30	•SUGV	81
•Medical Vehicle	29		

- **Adds two UA Battalions**
- **Adds two NLOS Batteries**
- **Full complement of MV/C2V/UAVs**

Full Unit of Action

C4ISR Work Packages

FUTURE COMBAT SYSTEMS
FCS
One Team-The Army/Defense/Industry


General Dynamics – Bloomington, Minnesota
Integrated Computer System – PKG 26
Textron Systems - Wilmington, Massachusetts
Unattended Ground Sensors – PKG 15
Raytheon Company – Ft. Wayne, Indiana
Battle Command and Mission Execution – PKG 18
Boeing, Mesa, AZ
Warfighter Machine Interface-PKG 23
Northrop Grumman Mission Systems - Carson, California
Network Management – PKG 17
BAE Systems/CNIR – Wayne, New Jersey
Ground Comm.– PKG 24
Air Comm.-PKG 25
Northrop Grumman Sys Corp – Linthicum, Maryland
Air Sensor Integrators-PKG 14
Lockheed Martin (Orincon) Defense Corp - San Diego, California
Level 1 Fusion – PKG 16
General Dynamics Decision Systems – Scottsdale, Arizona
Sensor Data Management – PKG 16
Planning and Preparation – PKG 19
Austin Info Systems - Austin, Texas
Situation Understanding – PKG 20
Raytheon Network Systems - Plano, TX
Ground Sensor Integrators-PKG 12

Sustainment

FUTURE COMBAT SYSTEMS
FCS
One Team-The Army/Defense/Industry

- **Provides the functions and services to assess and maintain personnel and equipment readiness, support deployment and operations training**

- **Provides status on physical and functional availability on both platforms and soldiers from which readiness can be derived to support Command and Control and Logistics**

- **Collects observations on consumption, LRU repair and replacement, delivery and receipt**

C4ISR is a Key Enabler for Sustainment